

New and Soft Insecticides

**Diane Alston
Entomologist**

**Utah State University Extension
Pesticide Recertification Workshops
2005**



**Acknowledgement: Alan Roe, USU
Extension Insect Diagnostician for
insecticide database information**



Pest Management Resources on the Web



EXTENSION

UtahState
UNIVERSITY



COOPERATIVE
EXTENSION

CONTINUING
EDUCATION

COOPERATIVE
EXTENSION

CONFERENCE
SERVICES



Extension Search Search ALL SEARCH

Home > Cooperative Extension > Agriculture

[text version]

[En Español]

Agriculture

INDEX
PUBLICATIONS
ASK A SPECIALIST
COUNTY OFFICES
EXTENSIÓN EN ESPAÑOL

SOLUTIONS
4-H & Youth

Agriculture >

Community Development
Disability
Disaster
Diversity
Family Resources
Food & Nutrition
Home Gardening
Natural Resources

COWS AND PLOWS TO CLONED COWS AND ROBOT PLOWS

A big part of homeland security is a safe and secure food supply. Utah State University is not only a land-grant university but also a space-grant university that has supported and advanced Utah agriculture for



nearly 100 years bringing applied research from the campus to the farms and ranches around the state. Though we are no longer an agrarian society, agriculture is far from being a thing of the past in Utah. It is a growing and vibrant industry with an annual value to the Utah economy that exceeds one billion dollars. From cows and plows to cloned cows and robot plows, Utah State Extension is helping Utah grow.

Agriculture

Publications & Newsletters

Search:

SELECT A TOPIC

Ag in the Classroom
Agribusiness
Agriculture Environmental
Management Systems
Crops
Equine Extension
Insects & Plant Diseases
Livestock
Rangeland, Plants &
Forestry
Water & Drought

AGRICULTURE LINKS

Ag Experiment Station
Behave
National Agricultural Library
Space-Grant Extension

EXTENSION
UtahState
UNIVERSITY

Insects and Plant Diseases



Mormon Cricket

Insects and
Their Relatives



Delta Trap

Integrated Pest
Management



Apple Mosaic Virus

Plant Diseases

[FAQ](#)

[Photo Gallery](#)

Integrated Pest Management



Extension Search Search ALL SEARCH

Home > Cooperative Extension > Integrated Pest Management

[\[text version\]](#) [\[En Español\]](#)

CURRENT ISSUES

Tree Fruit Advisories
Orchard Spray Timing
Fire Blight
Utah Mosquito Abatement

PUBLICATIONS

OUTREACH

Home Use Pesticides
Recent Slide Shows
Mini-Grant Program
Pesticide Registration
Updates

ADDITIONAL RESOURCES

National Pest Alerts
Other IPM Links
Utah Department of

Integrated Pest Management

Integrated Pest Management (IPM) is a strategic approach to crop production that seeks to effectively suppress pest populations while minimizing pest control costs and environmental disruption.

Typically, an IPM approach integrates numerous control tactics, and treatments are made only when necessary. Treatment decisions are based on information derived from site-specific scouting, crop economics, elements of pest biology, agroecology, host-plant genetics, toxicology, and weather.

Clicking on the links in the left sidebar will provide specific information on managing tree fruit pests in Utah orchards.

Visit the [Utah Plant Diseases website](#) for a wealth of information on disease identification, prevention, and management.

Shawn Steffan, Extension IPM Project Leader
Dept. of Biology, Utah State University
5305 Old Main Hill
Logan, UT 84322-5305
steffan@biology.usu.edu



Insects and Their Relatives USU Extension Entomology

Fact Sheets

Fact sheets provide information on a wide variety of common insects and their relatives, including identification, life cycle, habits, damage, and control.

How To Submit Insects

Instructions for collecting, preserving, and submitting specimens of insects and their relatives or samples of their damage.

Printable Form

Form for submitting specimens of insects and their relatives or samples of their damage; use the Print feature of your browser to produce a copy.

USU Ag Agent Intranet Link

For USU County Agriculture Agents: click above to access the Intranet website. User ID and password required.

[HOME](#)

[Faculty / Staff](#)

[Biology](#)

[IPM](#)

[Extension](#)

[USU](#)

Please direct comments, suggestions or questions regarding this website to Alan H. Roe at: alanr@ext.usu.edu



Utah State
UNIVERSITY
EXTENSION

Department of Biology: Plant Pathology



**General Plant
Pathology**



**Non-pathogenic
Disorders**



**Alfalfa & Grain
Diseases**



Fruit Diseases



**Ornamental
Diseases**



Turf Diseases



**Vegetable
Diseases**



**Biological
Control of Dyer's
Woad**



**Exotic Pest
Monitoring
Series**

Welcome to the Utah State University plant disease site.

Effective disease control depends primarily on early, accurate identification of the disease and the causal agents. In most cases, it is too late to control a disease on a plant once the disease appears. However, timely control measures can prevent the disease from spreading to other plants.

You may contact us at:
USU Department of Biology
Plant Pathology
Logan, Utah 84322-5305
1-435-797-2515

Photo Gallery

Insects and Plant Diseases > FAQ > Summer

Fall

Winter

Spring

Summer >

Summer FAQ's:

1. What's eating your raspberries besides you?
2. How do I protect my zukes and cukes from the annual onslaught of squash bugs?
3. You may not want to question authority, but do question validity of gardening catalog claims
4. Is there any way to eliminate borers that leave what looks like sawdust at the base of our aspen trees?
5. How can I control the tiny pests flying around my house plants?
6. How can I keep my pears and apples worm free?
7. What causes plants to look dirty and lose their green color during the heat of the summer? One culprit is spider mites.
8. How do I protect my peach trees from insects?
9. How can I tell if the spider I found is a hobo spider?
10. What is West Nile Virus and how can I keep myself safe from it?

Insects and Plant Diseases

Close

GREEN FRUIT WORMS



by Courtney Susan A. Sadtler
Utah State University Extension

More Images

59 of 174

Green Fruitworm Adult

The adult green fruitworm (*Lithophane antennata*) is a stout moth (3/4-1 inch long) with grayish brown coloration and subtle wing markings (pictured). It is similar in appearance to the adult speckled green fruitworm (*Orthosia hibisci*), although the speckled green fruitworm wing has a reddish-brown hue. The green fruitworm overwinters as an adult in leaf litter, and it lays large egg masses (100-360 eggs) in the canopy of pome and stone fruit trees. Green fruitworm caterpillars feed on buds, leaves, and flowers.

Green Fruit Worms (8)



Choose a new category / Click on a photo to enlarge





The Integrated Pest Management Concept



Integrated Pest Management (IPM)



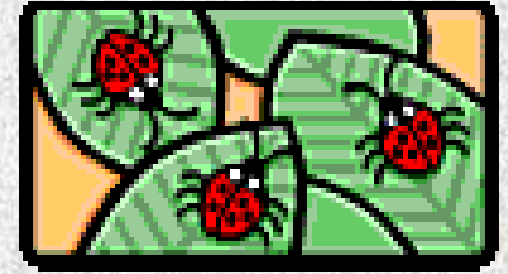
The practice of using **multiple techniques** to manage pests (e.g., cultural, mechanical, biological and chemical controls) while minimizing negative impacts to the environment.

Use of pest controls are based on a “real need” (thresholds)

Economically viable



IPM Approach



1. Proper **diagnosis** of problem
2. Regular **scouting** for problems
3. **Target** susceptible life stage with good **timing**
4. **Record-keeping**
5. Use **multiple** techniques
 - **Short-term suppression and long-term maintenance**

Insect and Mite Controls

- **Conventional insecticides (nerve toxins):**
 - phosmet (Imidan), diazinon, malathion, endosulfan (Thiodan), carbaryl (Sevin), permethrin, bifenthrin (Talstar), cyfluthrin (Tempo)
- **Reduced-risk insecticides (lower toxicity):**
 - Oils (Dormant, Horticultural)
 - Insecticidal soaps (fatty acids)
 - Biologicals: Bt (Dipel; M-one), spinosad (Conserve), Codling Moth Virus (CydX, Virusoft), *Beauveria* (fungus), insect parasitic nematodes
 - Botanicals: pyrethrin (Pyganic), Neem oil (Azatin)
 - Inorganic products: kaolin clay particle film (Surround), diatomaceous earth (silica), sulfur
 - Insect growth regulators: methoxyfenozide (Intrepid), pyriproxifen (Esteem), diflubenzuron (Dimilin)
 - Neonicotinoids: imidacloprid (Bayer Adv. Garden, Merit), acetamiprid (Assail)
 - Communication/Behavior Disruptants: insect pheromones (Last Call; attract-and-kill), feeding baits (fruit fly bait)
- **Cultural Controls:**
 - Traps, barriers, exclusion devices, sanitation, cultivation, resistant varieties, adjust planting time



Understanding Insect Biology as a Foundation for Pest Management



Insect Biology

- 2 main life histories: **complete and gradual**
- Immature insects are primary damaging stage (adults sometimes too)
- Most often **target hatching eggs and young** insects with control tactics

Complete Development



Gradual Development



Suppression of Insect Eggs

- **Suffocants**
 - Dormant and horticultural mineral oils
 - Most effective when applied just before egg hatch
- **Insect growth regulators**
 - Ovicides
 - Must be applied before eggs are laid down on plant material
- **Mechanical**
 - Squish method

Whitefly
life stages



Suppression of Insect Young

- **Suffocants/Disruptants for soft-bodied young**
 - Oils, soaps
- **Insect growth regulators**
 - Interfere with development of young (molt, cuticle, prevent maturity) – ingestion/contact activity
- **Biologicals**
 - Bt, spinosad, fungi (*Beauveria bassiana*), viruses, nematodes – need to be ingested or live agents penetrate
 - High specificity
- **Exclusion**
 - Sticky bands, diatomaceous earth



Codling moth larva

Suppression of Insect Young

- **Contact Activity**
 - Organophosphates, carbamates, pyrethroids, inorganics (sulfur), etc.
- **Systemic Activity**
 - Imidacloprid (Merit), acephate (Orthene)
- **Fumigant Activity**
 - Gases, sulfur

Thrips
larva



Suppression of Insect Adults

- **Contact Activity**
 - **Fast Knock-down (Days-Week)**
 - Pyrethroids (fast knock-down): Talstar, Tempo, Scimitar, permethrin
 - Pyrethrin (botanical version)
 - **Longer-lasting Suppression (Weeks)**
 - Organophosphates, carbamates
 - **Insect growth regulators (Weeks)**
 - Female birth control
- **Systemics (Weeks-Months)**
- **Fumigants (Weeks-Months)**
- **Traps, Exclusion**



Flatheaded Borer Adult

Traps and Physical Barriers

- Traps
 - Yellow jacket wasps, slugs, spiders
- Sticky bands
 - Trees and shrubs





New Insecticide Classes and Active Ingredients



Utah-Registered Insecticides

- Over **150 total active ingredients** in agricultural & commercial products
- Over **500 total brands**
- **“New” insecticides** (since 1995): approx. **29 active ingredients and 57 brands**
- Insecticides grouped by **mode of action**
- Insecticide Resistance Action Committee (IRAC)
- By rotating modes of action, you can manage for **insecticide resistance**

“Old” Classes of Insecticides

Nerve Poisons

- Carbamates (Group 1A):
 - **Sevin, Vendex, Lannate**
- Organophosphates (Group 1B):
 - **Diazinon, Malathion, Dursban, Orthene**
- Organochlorines (Group 2):
 - **Thiodan, Lindane, Kelthane, DDT**
- Synthetic Pyrethroids (Group 3):
 - **Pounce, Astro, Talstar, Tempo**



“New” Insecticides with Broad-Spectrum Activity



Sucking insects



Chewing insects



Borers

Nicotinoids



White grub



Aspen borer

- Derived from **nicotine**
- Most have **systemic activity**; if applied to soil or injected can last for a season
- **Neurotoxin** – interfere with nerve impulses
 - **Merit - Woody Ornamentals, Turf**
 - Chewing & Sucking Insects: Aphids, Scale, Leaf beetles, Leafhoppers, Thrips (suppression), Root weevils, Billbugs, White grubs, Cutworms, Flatheaded borers, Roundheaded borers (suppression), Bark beetles (suppression)
 - **Safari & Tri-Star - Herbaceous and Woody Orn., Turf**
 - **Provado, Assail, Calypso, Actara – Fruits & Veggies.**

Spinosad



Sod webworm



Thrips

- **Bacterial** fermentation product
- *Saccharopolyspora spinosa* discovered in soil of abandoned rum distillery in the Caribbean
- **Neurotoxin** – novel binding site in nerve transmission
 - **Conserve – Herbaceous & Woody Orn., Turf**
 - Chewing & Sucking Insects: Caterpillars, Beetles, Thrips, Fly larvae, Leafminers, etc.
 - **Elector & Extinsad – Livestock**
 - **Success & Entrust (organic) – Fruits & Veggies.**

“New” Insecticides with Activity on Sucking Insects



Aphids



Thrips



Scale insects



Plant bugs

Flonicamid



Giant willow aphid



Lace bug

- Antifeedant, leads to starvation
- Systemic, nicotine-derived
- Unique, but undetermined mode of action
 - **Aria – Herbaceous & Woody Orn.**
 - Aphids, Whiteflies, Scale, Mealybugs, Leafhoppers, Thrips, Plant bugs, Stink bugs

Pymetrozine

- Antifeedant
- Neuromuscular effects, prevents insertion of insect stylets
 - Endeavor – Herbaceous ornamentals, Greenhouse
 - Aphids, Whiteflies
 - Fulfill – Vegetables
 - Aphids



Aphid



Whiteflies

“New” Insect Growth Regulators

IGRs: Disrupt growth, molting, formation of cuticle (exoskeleton), and maturation of eggs in females (birth control)

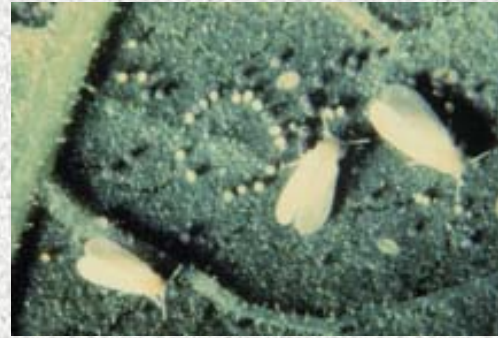


Thrips



Sod webworm

Novaluron



Whiteflies



Thrips

- IGR: **chitin synthesis inhibitor**, prevents proper formation of exoskeleton after molting
 - **Pedestal – Ornamental flowering plants, Greenhouse**
 - Whiteflies, Thrips, Leafminers, Armyworms, Plant bugs
 - **Rimon – Pome fruits, Ornamentals, Potatoes**
 - Codling moth, Colorado potato beetle, Pests listed above

Diacylhydrazines



White grubs

- IGR: Disrupts/mimics **molting hormone**, induces premature molting
 - **Mach 2 – Turf**
 - Billbugs, White grubs, Masked chafers, Sod webworms, Cutworms
 - **Confirm – Fruits, Veggies. & Ornamentals**
 - Webworms, Leafrollers, Armyworms
 - **Mimic – Woody Ornamentals**
 - Many caterpillars
 - **Intrepid – Fruits & Veggies.**
 - Codling moth, Leafrollers, Webworms



Tent caterpillar

“New” Miticides



Twospotted Spider Mite



Leaf Blister Mite

Clofentezine & Hexythiazox



Twospotted spider mite

- Mite **growth inhibitor**
- Acts primarily as an **ovicide** (kills eggs) with some effect on early instars (first stages of young)
- Need to **apply “early”** in development of a mite population
- Translaminar activity (local systemic uptake)
 - **Ovation & Hexagon – Flowering Orn., Greenhouse, Nursery**
 - Twospotted spider mite, McDaniel spider mite, European red mite
 - **Apollo, Onager & Savey – Tree Fruits & Raspberry (Savey only)**

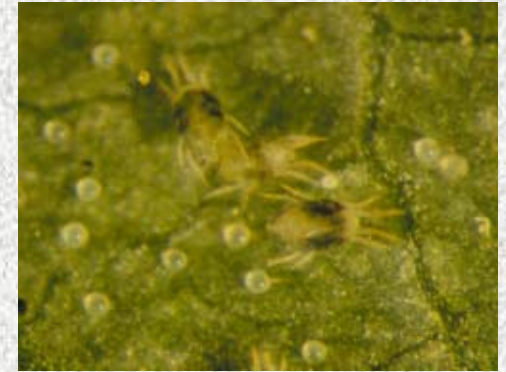
Etoxazole



European red mite

- Mite **growth inhibitor**
- Acts primarily as an **ovicide** (kills eggs) with some effect on early instars (first stages of young)
 - **Tetrasan – Woody & Herbaceous Orn.**
 - Twospotted spider mite, McDaniel spider mite, European red mite
 - **Zeal – Fruit & Nut Trees, Strawberries**

Chlorfenapyr



Spider mites

- Insecticide/miticide
- Interferes with formation of **ATP**, which is the “fuel” for muscle contractions
 - **Pylon – Herbaceous Ornamentals**
 - Mites, Thrips, Fungus gnats, Loopers, Fruitworms, Budworms
 - **Phantom – Indoor sites & Outdoor soil treatments**
 - Ants, Cockroaches, Termites

Pyridazinones

Spider mites



- Inhibits mitochondrial electron transport, affects **respiration**
- Same mode of action as rotenone
 - **Akari & Nexter – Herbaceous & Woody Orn.**
 - **Sanmite – Herbaceous Orn., Greenhouse**
 - Spider mites, Whiteflies, Leafhoppers
 - **Fujimite, Pyramite, Nexter –Fruits**
 - Spider mites, Leafhoppers, Aphids, Pear psylla



Whiteflies

Acequinocyl

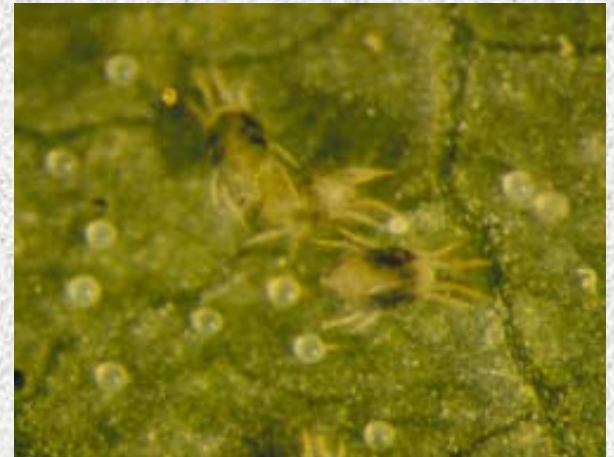


Spruce spider mite

- Inhibits mitochondrial electron transport, affects **respiration**
- Different site of action than other METI compounds
 - **Kanemite & Shuttle – Herbaceous Ornamentals, Pome Fruits, Strawberries**
 - Spruce spider mite, Twospotted spider mite, European red mite

Bifenazate

- Carbazate (related to carbamates)
- Neurotoxic, but exact MOA unknown
 - Floramite – Flowering & Woody Orn., Turf
 - Spider mites
 - Acramite – Stone & Pome Fruits, Grapes, Veggies.



Spider mites

“New” and “Low Toxicity” Insecticides

Sucrose Esters and Fungus



Caterpillars



Grasshoppers

Sucrose Octanoate Esters

- Active ingredient found on tobacco leaf hairs
- Dissolves insect **exoskeleton**
 - **Sucroicide – General labeling: Field, Fruit, Vegetable, and Ornamental Plants**
 - Aphids, Leafhoppers, Scales, Whiteflies, Plant bugs, Caterpillars, Fungus gnats, Mites



Caterpillar

Beauveria bassiana



Grasshopper

- **Fungus**, natural soil organism
- Fungal hyphae penetrate the insect's exoskeleton
 - **Botanigard & Naturalis – Ornamentals, Turf, Fruits, Vegetables, Grains, Forages**
 - Aphids, Plant bugs, Caterpillars, Beetle larvae, Mormon cricket, Grasshoppers, Mites

“Older” and “Lower Toxicity” Insecticides

- Horticultural Oils
 - Dormant, Summer
- Neem & Neem oil
 - Azadirachtin
- Insecticidal Soap
- Kaolin Clay
 - Surround
- *Bacillus thuringiensis*
 - Soil bacterium, Caterpillars, Beetles, Mosquitoes, Fungus gnats
- Diatomaceous earth
 - Ground-dwelling or climbing insects & snails/slugs

“Rules of Thumb” for lower toxicity insecticides:

- Critical to target most susceptible insect life stages (eggs, early immature)
- Short residual - reapply every 5-10 days until pest subsides
- Selective for target pests, minimize harm to the beneficials

Try the New Insecticides

- Replace “older”, “higher toxicity” insecticides with “new” insecticide choices
- Use them in an IPM framework
- Trade “insecticides” for “labor” where you can [plant site selection, scouting, physical activities (pruning, removal, barriers), modifying habitat to encourage beneficials, long-term planning, etc.]